

THE ASSOCIATION BETWEEN DIABETES SELF-CARE
ACTIVITIES AND DISTRESS WITH GLYCAEMIC CONTROL
AMONG TYPE 2 DIABETES MELLITUS (T2DM) PATIENTS IN
HOSPITAL PAKAR UNIVERSITI SAINS MALAYSIA (HPUSM)

NUR HANISYA HIKMAH BINTI HERMAN

SCHOOL OF HEALTH SCIENCES
UNIVERSITI SAINS MALAYSIA

JUNE 2026

THE ASSOCIATION BETWEEN DIABETES-SELF CARE
ACTIVITIES AND DISTRESS WITH GLYCAEMIC CONTROL
AMONG TYPE 2 DIABETES MELLITUS (T2DM) PATIENTS IN
HOSPITAL PAKAR UNIVERSITI SAINS MALAYSIA (HPUSM)

by

NUR HANISYA HIKMAH BINTI HERMAN

Dissertation submitted in partial fulfilment of the requirement for the
degree of Bachelor of Health Science (Honours) (Dietetics)

JUNE 2026

ACKNOWLEDGEMENT

First and foremost, I would like to express my deepest gratitude to Allah SWT for granting me the strength, patience and perseverance to complete this thesis successfully. I am sincerely thankful to my supervisor, Dr. Juliana binti Shamsudin for her invaluable guidance, constructive feedback, and continuous encouragement throughout the research process. Her expertise and support have been vital in shaping this work. My appreciation also goes to lecturers and staff of the School of Health Sciences, Universiti Sains Malaysia, for their assistance throughout my journey of completing the research. I would like to extend my heartfelt thanks to the respondents and hospital staff at Hospital Pakar Universiti Sains Malaysia (HPUSM) who generously gave their time and cooperation, without which this study would not have been possible. A special thanks to my family and friends for their support, prayers and motivation. Finally, I would like to thank all those who contributed, directly or indirectly, to the completion of this thesis. Your support and kindness will always be remembered.

TABLE OF CONTENT

CERTIFICATE	ii
DECLARATION	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENT	v
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF ABBREVIATION	viii
ABSTRAK.....	ix
ABSTRACT	xi
Chapter 1 Introduction.....	1
1.1 Background of Study.....	1
1.2 Problem Statement	2
1.3 Rationale and Justification of Study	3
1.4 Research Questions.....	5
1.5 Research Objectives	5
1.5.1 General Objective	5
1.5.2 Specific Objectives.....	5
1.6 Research Hypotheses.....	5
1.6.1 Hypothesis I	5
1.6.2 Hypothesis II	6
Chapter 2 Literature Review.....	7
2.1 Review of Study Population	7
2.2 Glycaemic control in Diabetes Patients in Malaysia.....	7
2.3 Diabetes-Related Distress among T2DM Patients.....	8
2.4 The Association between Diabetes Self-care Activities and Glycaemic Control.....	9

2.5 The Association between Diabetes-Related Distress and Glycaemic Control	10
2.6 Conceptual Framework	11
Chapter 3 Methodology	13
3.1 Research design	13
3.2 Study Area	13
3.3 Study Population	13
3.4 Selection Criteria.....	14
3.4.1 Inclusion Criteria	14
3.4.2 Exclusion Criteria	14
3.5 Sample size estimation	14
3.5.1 Sample size calculation based on specific objectives 1.....	14
3.5.2 Sample size calculation based on specific Objectives 2.....	15
3.6 Sampling Method and Subject Requirement.....	16
3.7 Research Tools and Materials	17
3.7.1 Part A: Socio-demographic Data	18
3.7.2 Part B: Medical History and Medication Compliance	18
3.7.3 Part C: The Summary of Diabetes Self-care Activity (SDSCA)	18
3.7.4 Part D: Diabetes Distress Screening Scale	19
3.8 Operational Definition.....	19
3.8.1 Good adherence to diabetes self-care activities	19
3.8.2 Good glycaemic control	19
3.8.3 Poor glycaemic control.....	20
3.8.4 Diabetes-related distress/diabetes distress	20
3.9 Data collection method.....	20
3.10 Study Flowchart	21
3.11 Data Analysis	23

3.12 Ethical Considerations	24
Chapter 4 Results	25
Chapter 5 Discussion	33
Chapter 6 Conclusion.....	43
References.....	44
Appendices.....	50
Appendix A: Research Questionnaire (English).....	50
Appendix B: Research Questionnaire (Malay).....	58
Appendix C: Subject Information and Consent Form (English).....	67
Appendix D: Subject Information and Consent Form (Malay).....	73
Appendix E: JEPEM Approval letter.....	81
Appendix F: OBB Form	82
Appendix G: Permission from author to use questionnaires	83

LIST OF TABLES

Table 4.1 Sociodemographic data among T2DM Patients in Hospital Pakar USM
Table 4.2 Clinical Characteristics of T2DM Patient in Hospital Pakar USM
Table 4.3 Number of Comorbidities per Participant
Table 4.4 Correlation Between Summary of Diabetes Self-Care Activities (SDSCA) subscales and HbA1c (%)
Table 4.5 Diabetes-Related Distress (DDS) experienced by T2DM patients in Hospital Pakar USM
Table 4.6 Correlation Between Diabetes Distress Scale-17 (DDS-17) subscale and HbA1c (%)

LIST OF FIGURES

Figure 1 Conceptual Framework	24
Figure 2 Flow Chart	34

LIST OF ABBREVIATION

T2DM	Type 2 Diabetes Mellitus
DRD	Diabetes-Related Distress
SDSCA	Summary of Diabetes Self-Care Activities
MDDS-17	Malay Diabetes Distress Scale-17
DDS-17	Diabetes Distress Scale-17
HbA1c	Glycated Haemoglobin
OAD	Oral Antidiabetic Drug
BMI	Body Mass Index
FBG	Fasting Blood Glucose
HPUSM	Hospital Pakar Universiti Sains Malaysia
NHMS	National Health Morbidity Survey
IDF	International Diabetes Federation
SPSS	Statistical Package for the Social Sciences

HUBUNGKAIT ANTARA AKTIVITI PENJAGAAN DIRI PESAKIT DIABETES DAN TEKanan AKIBAT DIABETES DENGAN KAWALAN GLISEMIK DALAM KALANGAN PESAKIT DIABETES MELLITUS JENIS 2 (T2DM) DI HOSPITAL PAKAR UNIVERSITI SAINS MALAYSIA

ABSTRAK

Diabetes mellitus jenis 2 (T2DM) merupakan salah satu beban kesihatan awam utama di Malaysia, dengan kawalan glisemik yang lemah menyumbang kepada kadar komplikasi yang tinggi. Faktor tingkah laku dan psikologi seperti aktiviti penjagaan sendiri diabetes dan tekanan berkaitan diabetes (DRD) semakin diberi perhatian sebagai aspek penting dalam pengurusan diabetes. Kajian ini bertujuan untuk menentukan hubungan antara aktiviti penjagaan sendiri diabetes dan DRD dengan kawalan glisemik dalam kalangan pesakit T2DM di Hospital Pakar Universiti Sains Malaysia (HPUSM). Reka bentuk kajian keratan rentas dengan pensampelan mudah (*convenience sampling*) digunakan, melibatkan 116 pesakit dengan menggunakan soal selidik *Summary of Diabetes Self-Care Activities (SDSCA)* dan *Malay Diabetes Distress Scale-17 (MDDS-17)*. Tahap HbA1c dalam tempoh 3–6 bulan terakhir diperoleh daripada rekod perubatan. Analisis data dijalankan menggunakan korelasi Spearman. Secara keseluruhan, 24.1% pesakit mencapai kawalan glisemik baik ($\text{HbA1c} < 7\%$), manakala 75.9% mempunyai kawalan glisemik yang teruk ($\text{HbA1c} \geq 7\%$). Bagi aktiviti penjagaan sendiri diabetes, tahap pematuhan tertinggi dicatatkan bagi pemakanan sihat umum (57.9%), dengan lebih separuh peserta melaporkan pematuhan sekurang-kurangnya lima hari seminggu. Sebaliknya, pematuhan terhadap cadangan diet khusus seperti pengambilan buah dan sayur adalah yang paling rendah (<4). Dari segi tekanan berkaitan diabetes, 94.8% pesakit tidak mengalami tekanan, 4.3% mengalami tekanan sederhana, dan 0.9% mengalami tekanan tinggi. Hasil kajian menunjukkan bahawa

SDSCA tidak mempunyai hubungan yang signifikan secara statistik dengan HbA1c ($p = 0.34$), manakala DRD turut tidak menunjukkan korelasi signifikan dengan HbA1c ($p = 0.41$). Walaupun dapatan tidak menunjukkan hubungan statistik yang signifikan, DRD tetap relevan dari segi klinikal kerana ia mungkin mempengaruhi tingkah laku pematuhan dan hasil jangka panjang secara tidak langsung. Dapatan ini menekankan kepentingan saringan psikososial secara rutin serta intervensi berpusatkan pesakit yang menekankan sokongan pematuhan dan pengurusan tekanan emosi. Pendekatan ini berpotensi meningkatkan kawalan glisemik jangka panjang dan mengurangkan komplikasi dalam kalangan pesakit T2DM di Malaysia.

**THE ASSOCIATION BETWEEN DIABETES-SELF CARE
ACTIVITIES AND DISTRESS WITH GLYCAEMIC CONTROL
AMONG TYPE 2 DIABETES MELLITUS (T2DM) PATIENTS IN
HOSPITAL PAKAR UNIVERSITI SAINS MALAYSIA (HPUSM)**

ABSTRACT

Type 2 diabetes mellitus (T2DM) is a major public health burden in Malaysia, with poor glycaemic control contributing to high rates of complications. Behavioural and psychological factors such as diabetes self-care activities and diabetes-related distress (DRD) are increasingly recognized as important in diabetes management. This study intended to determine the relationship between diabetes self-care activities and DRD with glycaemic control among patients with T2DM at Hospital Pakar Universiti Sains Malaysia (HPUSM). A cross-sectional design with convenience sampling was employed, involving 116 patients using the Summary of Diabetes Self-Care Activities (SDSCA) and the Malay Diabetes Distress Scale-17 (MDDS-17). HbA1c levels in the last 3–6 months were obtained from medical records. Data analysis was conducted using Spearman's correlation. Overall, 24.1% of patients achieved good glycaemic control (HbA1c < 7%), while 75.9% had poor glycaemic control (HbA1c ≥ 7%). For diabetes self-care activities, the highest level of adherence was observed for general healthful eating (57.9%), with more than half of participants reporting compliance for at least five days per week. In contrast, adherence to specific dietary recommendations such as fruit and vegetable intake was the lowest (<4%). Regarding diabetes-related distress, 94.8% of patients reported no distress, 4.3% reported moderate distress, and 0.9% reported high distress. Findings showed that SDSCA did not have a statistically significant relationship with HbA1c ($p = 0.34$), while DRD also did not show a significant correlation with HbA1c ($p = 0.41$). Although no statistical significance was observed, DRD remains clinically relevant as it may indirectly influence adherence behaviours and long-term outcomes. These findings highlight the importance of routine psychosocial screening and patient-centred

interventions that emphasize adherence support and emotional management. Such approaches have the potential to improve long-term glycaemic control and reduce complications among patients with T2DM in Malaysia.

Chapter 1 Introduction

1.1 Background of Study

Type 2 diabetes mellitus (T2DM) is a disorder that ranks among the chronic ailments growing most rapidly worldwide today. As reported by the International Diabetes Federation (IDF) 537 million adults were living with diabetes in 2021 with this number expected to increase significantly in the coming decades (Magliano et al., 2021). The current study identified a high prevalence of diabetes mellitus (DM) at 18.3% (95% CI: 17.08, 19.58), indicating that 1 in 5 Malaysians is affected by DM. The prevalence is the highest when compared to studies from other nations, including China (13%), Indonesia (10.8%), Thailand (11.6%), Singapore (14.7%), Nepal (8.5%), and Brazil (7.5%) (Ismail et al., 2021).

The significance of attaining glycaemic control has been recognized for a long time. Appropriate management of glycaemic control substantially reduces the significant risk factor for progression and complications caused by diabetes (Haghighatpanah et al., 2018). Desired self-care behaviour facilitates good glycaemic control. Despite the well-known benefit of self-care, the level of self-care among T2DM patients still far beyond optimum (Almomani & AL-Tawalbeh, 2022). One significant reason for adherence is diabetes-related distress (DRD) which refers to the emotional stress caused by the ongoing challenge of handling diabetes. DRD were found to be associated with lesser adherence to diet, exercise, frequent blood glucose testing and medication regimens (Devarajoo, 2018). Thus, it is crucial for clinicians, particularly dietitians, to emphasise diabetes self-care activities as dietary counselling and structured nutrition education have been proven to lower diabetes distress and improve overall quality of life (Jannoo et al., 2017). Dietitians play a crucial role in helping patients adjust their diet, monitor

blood glucose response to food and manage lifestyle changes, which in turn supports early detection and management of diabetes distress. (Abd El Kader et al., 2023)

In Malaysia, several studies show evidence on self-care activities affecting glycaemic control (Tharek et al., 2018; Amirthalingam et al., 2025). However, the recognition of behavioural factors linked to diabetes management is still increasing, with research investigating the joint impact of diabetes self-care behaviours and DRD on glycaemic control, in particular clinical environments is still scarce (Bariyyah et al., 2018).

1.2 Problem Statement

Type 2 diabetes mellitus (T2DM) remains as one of the top public health burden in Malaysia. The National Health and Morbidity Survey reported that more than one-quarter of Malaysian adults are living with diabetes, with prevalence increasing steadily over the past decade (Institute for Public Health, 2019). Even with advancements in treatment, global data indicate that only 20-30% of individuals with T2DM achieve optimal glycaemic control (Magliano et al., 2021). According to previous study, reduction in HbA1c by 1% is associated with reductions in the risk of any end point related to diabetes by 21% deaths related to diabetes by 21%, myocardial infarction by 14% and micro vascular complications by 37% (Bariyyah et al., 2018).

Effective diabetes management requires adherence to diabetes self-care activities including diet modification, regular physical activity, medication adherence, and self-monitoring of blood glucose. Study shows that better adherence to self-care behaviours is consistently associated with improved HbA1c and reduced risk of complications (Chen & Lin, 2025). However, many patients find it challenging to maintain these behaviours due to psychological and emotional barriers (Fisher et al., 2024)

DRD was originally introduced by Polonsky et al. in 1995 as specifically describing the negative emotional experiences that arise from the ongoing challenges

and demands of managing life with diabetes (Tan et al., 2025). There is evidence that diabetes-related distress (DRD) is associated with poorer self-management and higher glycated haemoglobin (HbA1c) levels (Park et al., 2024). In fact, DRD has been shown to be a more powerful predictor of glycaemic control compared to depression in several studies (Ajele & Idemudia, 2025).

However, previous research on diabetes management in Malaysia has been primarily focused on medication adherence and general factors affecting glycaemic control, such as duration of diabetes, BMI, age and lipid profile (Ahmad et al., 2013; Mahmood et al., 2016). However, psychosocial factors like diabetes-related distress are not widely studied locally with only a few Malaysian studies reporting the prevalence and indirect impact on self-management (Chew et al., 2016; Tan et al., 2025). There is consistent international evidence that diabetes distress impairs adherence and indirectly increases HbA1c outcomes (Polonsky et al., 1995; Fisher et al., 2010). Hence, the present study would like to investigate the association between diabetes self-care activities and diabetes-related distress with glycaemic control among Type 2 diabetes patients in Hospital Pakar USM. This study addresses gaps in local literature by integrating behavioural and psychological dimensions and provides evidence that can guide the development of more targeted, patient-centred interventions tailored to Malaysian clinical settings.

1.3 Rationale and Justification of Study

This study aims to examine whether diabetes self-care activities and diabetes distress are associated with glycaemic control outcomes among patients with type 2 diabetes mellitus (T2DM) at Hospital Pakar USM, Kelantan. To better understand the glycaemic control of these patients, HbA1c values of all study participants will be obtained. Diabetes self-care activities will be assessed using the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire, which captures the types of self-care

behaviours performed in the past seven days and their frequency. Diabetes distress will be measured using the Malay version Diabetes Distress Screening Scale (MDDS-17), which identifies whether patients experience moderate or severe distress warranting clinical attention.

The SDSCA was selected as a research instrument because it is one of the most widely used and validated tools for assessing diabetes self-care activities across diverse populations (Gaćina et al., 2025). The MDDS-17 was chosen to measure diabetes distress as it uniquely captures distress directly related to living with diabetes, unlike general psychological scales. Furthermore, the DDS-17 has demonstrated strong reliability and validity across different populations (Chew et al., 2015).

Although previous studies have established the importance of diabetes self-care activities and diabetes distress, there remains limited evidence on how these factors interact to influence glycaemic control outcomes among patients with T2DM in Malaysia. In particular, most local studies have primarily focused on medication adherence and general clinical predictors such as age, BMI, duration of diabetes and lipid profile (Ahmad et al., 2013; Mahmood et al., 2016). Few have explored the combined impact of psychological distress and self-care behaviours on glycaemic outcomes, especially within tertiary teaching hospital settings such as Hospital Pakar USM. This gap is important because distress can interfere with patients' ability to engage in important self-care behaviours, including diet control, physical activity, and medication adherence, which directly affect blood glucose levels (Fayed et al., 2022).

The increasing prevalence of T2DM in Malaysia are concerning and requires a strategic focus on modifiable behaviours such as diet, physical activity and medication adherence alongside addressing psychological determinants like diabetes distress, motivation, and health literacy. According to national survey report in Malaysia in 2023, diabetes is one of the top cause of death in Malaysia with prevalence of 15.6%, which means 1 in 6 adults in Malaysia have diabetes (Institute for Public Health, 2024). Based on a systematic review, the overall prevalence of diabetes stands at 14.39%, meaning

that about one in every seven individuals in Malaysia is affected by the condition. The rate of diabetes in Malaysia is notably greater than that of neighbouring nations, such as Singapore (5.5%) and Indonesia (6.2%) (Akhtar et al., 2022). Investigating how self-care behaviours and psychological distress affect glycaemic control in Malaysian tertiary care settings is important. This research fills a crucial gap in evidence and helps develop patient-focused interventions to reduce the growing diabetes burden.

1.4 Research Questions

1. Is there any association between diabetes self-care activities and glycaemic control among T2DM patients in Hospital Pakar USM?
2. Is there any association between diabetes distress and glycaemic control among T2DM patients in Hospital Pakar USM?

1.5 Research Objectives

1.5.1 General Objective

To determine the association between diabetes self-care activities and diabetes distress with glycaemic control among T2DM patients in Hospital Pakar USM.

1.5.2 Specific Objectives

1. To determine the association between diabetes self-care activities and glycaemic control among T2DM patients in Hospital Pakar USM.
2. To determine the association between diabetes distress and glycaemic control among T2DM patients in Hospital Pakar USM.

1.6 Research Hypotheses

1.6.1 Hypothesis I

Null Hypothesis, H_0 : There is no significant association between diabetes self-care activities and glycaemic control among T2DM patients in Hospital Pakar USM.

Alternative Hypothesis, H_1 : There is a significant association between diabetes self-care activities and glycaemic control among T2DM patients in Hospital Pakar USM.

1.6.2 Hypothesis II

Null Hypothesis, H_0 : There is no significant association between diabetes distress and glycaemic control among T2DM patients in Hospital Pakar USM.

Alternative Hypothesis, H_1 : There is a significant association between diabetes distress and glycaemic control among T2DM patients in Hospital Pakar USM.

Chapter 2 Literature Review

2.1 Review of Study Population

The study group consists of adults diagnosed with Type 2 Diabetes Mellitus (T2DM) receiving care at Hospital Pakar Universiti Sains Malaysia (HPUSM). Extensive evidence indicates that over the last twenty years, the incidence of diabetes mellitus in Malaysia has steadily increased and currently stands at nearly 18% (Tee & Yap, 2017). A study conducted in Pasir Puteh, Kelantan reported that 79.6% of T2DM patients had poor glycaemic control (Awang et al., 2020). Poor glycaemic control ($\text{HbA1c} \geq 7.0\%$) is proven to be closely related with diabetes complications (Haghighatpanah et al., 2018). A data from Ministry of Health Malaysia (2023) shows that 80.58% of T2DM patients in Kelantan have other comorbidities such as hypertension and 77.84% have dyslipidemia comorbidities (Ministry of Health Malaysia, 2023). Therefore, the HPUSM T2DM population was chosen as the study cohort because it represents a specialist tertiary care setting in Kelantan, where patients with comorbidities and psychological distress are managed. HPUSM represents a relevant and meaningful site for examining how self-care activities and diabetes-related distress influence glycaemic control within a real-world practice.

2.2 Glycaemic control in Diabetes Patients in Malaysia

Glycaemic control refers to the optimal serum glucose concentration in diabetic patient (Bin Rakhis et al., 2022). It is most commonly measured using glycated haemoglobin (HbA1c), which reflects average glucose over the past 2-3 months. Values $<7\%$ are generally considered good control, whereas value of $\geq 7\%$ indicate poor control (Ministry of Health Malaysia, 2020). A cross-sectional study conducted in Kedah have evaluate state-wide management and glycaemic control of T2DM patients at primary care level. This study include all T2DM patients who made at least one visit to any of the

58 public health clinics in Kedah from August 2016 to July 2017. A total of 23,557 patients were included in this study, with a mean HbA1c level of $8.4 \pm 2.23\%$. Only 15.6% of the population were found to have optimum glycaemic control (HbA1c level <6.5), and most patients were reported to also suffer from hypertension (75.8%) and dyslipidemia (74.1%). Diabetes-related complications were also reported, for example retinopathy (12.6%), nephropathy (10.1%) and ischemic heart disease (6.6%) (Syed Soffian et al., 2019). In another study conducted in primary health clinics in Kuala Selangor, out of 200 respondents, only 34% of the respondents had good glycaemic control (Tharek et al., 2018). This shows that proportion of poor glycaemic control is high among T2DM patients in Malaysia.

2.3 Diabetes-Related Distress among T2DM Patients

Type 2 diabetes mellitus (T2DM) leads to a growing psychosocial challenge for adult patients. Daily routines and social interactions are modified by persistent symptoms, the necessity of ongoing medication, and the increased requirements for maintaining a healthy lifestyle. Managing concerns regarding physical health, as well as communicating with healthcare providers about personal health beliefs and perceptions of illness, can be quite demanding (Chew et al., 2016). The most common psychological disorders experienced by patients with T2DM are diabetes-related distress (DRD) and depressive disorder (Tan et al., 2025). It is crucial to point out that diabetes-related distress is different from depression and general mental health. Diabetes-related distress is rooted in the day-to-day experience of living with diabetes, whereas depression is the general feeling of depressed effect, which is not linked to a specific condition or experience. Diabetes-related distress refers to 'the negative emotional or affective experience resulting from the challenge of living with the demands of diabetes (Skinner et al., 2020). There are several risk factors for DRD in T2DM patients which include adherence to complex therapeutic requirement, insulin initiation; the quality of social

support and inter-personal relationships with others including spouses (Chew et al., 2016).

According to previous research conducted in public health clinics in Seri Kembangan, Dengkil and Salak in Malaysia, the prevalence of DRD was 49.2% compared to prevalence of any degree depression was 41.7% with prevalence of moderate DRD was most frequently reported (29.7%). A study shows that younger age was linked to increased DRD which might be attributed to the limitations on active lifestyles imposed by diabetes treatment and the responsibilities of self-management (Chew et al., 2016).

2.4 The Association between Diabetes Self-care Activities and Glycaemic Control

The key aspect of managing diabetes is achieving proper blood sugar control and preventing complications associated with the disease. It is crucial to empower patients to take charge of their condition, as they must adjust their lifestyle to enhance their glycaemic management. Daily self-care practices are essential for individuals with diabetes to effectively control their condition. This includes monitoring blood glucose levels, adhering to medication regimens, staying physically active, following a healthy diet, developing good coping mechanisms, honing effective problem-solving abilities, and engaging in behaviours that reduce risk (Kang et al., 2018). Research conducted in Malaysia shows a significant occurrence of inadequate glycaemic control, with diabetes-related complications being widespread. It has been found that a contributing factor to this issue is insufficient self-care among individuals living with diabetes. According to study conducted in public primary care in Malaysia, higher self-efficacy was associated with improved self-care behaviour which in turn associate with better glycaemic control (Tharek et al., 2018). This study shows that patients with stronger self-efficacy demonstrate better self-care behaviours, which leads to improved glycaemic control. However, many individuals still struggle to maintain these practices. This highlights the

need for research that examines self-care behaviours in depth, identifies barriers specific to the Malaysian context and help develop a relevant interventions to improve patient self-management and reduce the growing impact of type 2 diabetes (Bariyyah et al., 2018)

2.5 The Association between Diabetes-Related Distress and Glycaemic Control

Diabetes-related distress is a unique emotional problem that is directly related to the burden and anxieties felt by T2DM patients. Diabetes-related distress may lead to pessimism and lower self-efficacy which resulted in a deficiency of self-treatment compliance and can cause further bad glycaemic control (Bhaskara et al., 2022). Diabetes distress is distinct from depression and conceptually rooted in the demands of diabetes management and resulting from emotional adjustment. It has been found to be significantly associated with glycated haemoglobin (HbA1c) level and several studies report that people experiencing diabetes distress have poorer HbA1c concentration than individuals without it (Poole & Hackett, 2024). According to study in Indonesia, there are four factors found to have relation with diabetes-related distress such as younger age, participants with dependency on caregivers, higher levels of Fasting Blood Glucose (FBG) and experiencing two or more T2DM complications (Arifin et al., 2019). Diabetes therapy regimen especially insulin is also found to have association with diabetes-related distress. Patients who use insulin are known to have higher level of distress compared to patients with diet and oral therapy (Bhaskara et al., 2022). This could be due to complexity of insulin injection compared to OAD (Oral Antidiabetic Drug) regiment; thus it requires more effort for the patients to use insulin, especially geriatric patients (Bhaskara et al., 2022). Based on previous study in USM Penang which involved 60 patients with T2DM , significant positive relationship ($p = 0.034$) was found between diabetes distress level and blood glucose level. The total mean score of diabetes distress among the patients was 2.8 which is considered as moderate level of distress (Alvani et al., 2015). According to meta-analysis, it is found that depression and diabetes distress

were significantly associated with poorer glycemic control and reduced self-care behaviours (Ajele & Idemudia, 2025). This finding prove the need to reinforce the importance of addressing psychological element of diabetes management. Collectively, these studies indicate that diabetes distress is both common and an important determinant of poor outcomes, hence there is a need for targeted interventions that will address emotional support and promote self-care to improve glycaemic control.

2.6 Conceptual Framework

Based on Figure 1, the conceptual framework illustrates that Diabetes Self-Care Activities and Diabetes Distress is the independent variables whereas glycaemic control is the dependent variable. This conceptual framework highlights the role of diabetes self-care activities and diabetes-related distress in influencing glycaemic control among patients with Type 2 Diabetes Mellitus (T2DM). While sociodemographic, disease-related factors, and medication adherence are included as background determinants, the primary focus of this study is on behavioural and psychological factors that directly affect HbA1c levels. The arrow with straight lines indicates hyphothesised relationships whereas arrow with dashed lines indicate direct relationships. In the present study, direct relationships involving age, gender, socioeconomic status, duration of diabetes and treatment type were examined. BMI and medication adherence were included in the framework for conceptual completeness but were not examined due to scope limitations. The study was designed to focus on sociodemographic and disease-related factors most relevant to the research objectives, while BMI and medication adherence were beyond the scope of the current investigation. The age and monthly household income levels were significantly associated with glycaemic control. It is found that younger age and lower household income were significantly associated with poorer glycaemic control (Scott et al., 2020). A study showed that there is significant association between BMI and glycaemic control, which is higher BMI led to poorer glycaemic control

(KennedyMartin et al.,2021). Duration of diabetes, type of treatment and medication adherence are also found to have significant association with glycaemic control (Sazlina et al., 2015). Medication adherence could also be affected by diabetes distress. Higher diabetes distress was significantly associated with poorer adherence to antidiabetic medication, underscoring the need for psychosocial support in diabetes care (Kumar et al., 2017)

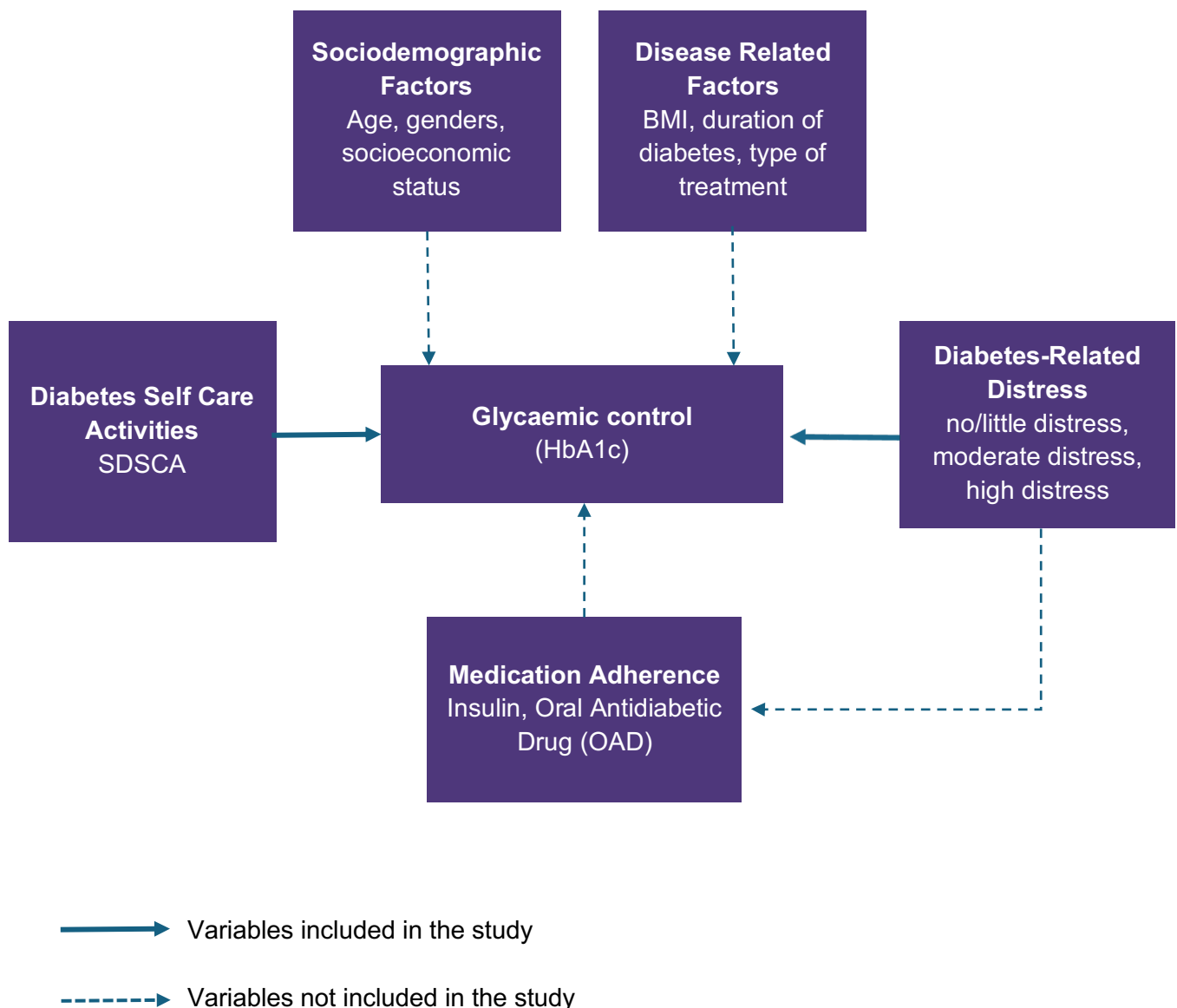


Figure 1 Conceptual Framework

Chapter 3 Methodology

3.1 Research design

This study used a cross-sectional study design and was conducted via the use of the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire and the Malay version of the Diabetes Distress Scale-17 (MDDS-17) questionnaire. The questionnaires were used to examine the diabetes self-care practices carried out by T2DM patients in Hospital Pakar USM from the components of diet, physical activity, blood sugar testing, foot care, and smoking. The cross-sectional study design was employed because it was an observational study method that enabled the researcher to simultaneously gather and compare several data. By employing this technique, the researcher was able to obtain data from the samples in a relatively brief period without requiring a huge amount of budget, time, or human resources. However, a key limitation of cross-sectional studies is that they only provide a snapshot at one point in time. This means they cannot establish causal relationships between variables, and findings may be influenced by other factors. Additionally, changes in outcomes or behaviours over time cannot be captured, which restricts the ability to assess long-term effects or trends.

3.2 Study Area

This study was conducted in Klinik Pakar Perubatan (KPP), Klinik Rawatan Keluarga (KRK), Outpatient Dietetics Clinic, Staff Clinic, and Diabetes Centre at Hospital Pakar USM located in Kubang Kerian, Kelantan since it is commonly visited by patients, including T2DM patients.

3.3 Study Population

The participants involved in this study were outpatient T2DM patients in Hospital Pakar USM.

3.4 Selection Criteria

3.4.1 Inclusion Criteria

1. Outpatients diagnosed with Type 2 Diabetes Mellitus.
2. Malaysian, age 19 years old and above.
3. Have recent HbA1c data within the last 3 months to 6 months in the medical folder.

3.4.2 Exclusion Criteria

1. Patients diagnosed with Type 1 Diabetes, disabled patients, critically ill or bedridden, pregnant women or those with any psychiatric illness.

3.5 Sample size estimation

3.5.1 Sample size calculation based on specific objectives 1

For specific Objectives 1, the sample size was calculated to determine the association between diabetes self-care activities and glycaemic control among patients with type 2 diabetes in HPUSM, Kelantan.

G*Power software was used for calculation of sample size. Previous study in Kelantan reported a significant negative correlation coefficient between diabetes self-care activities and glycaemic control ($r = -0.52$, $p = 0.0001$) (Ahmad Sharoni et al., 2015). Therefore, an effect size of $r = -0.52$ was applied. The alpha error of probability was set at 0.05, and the power of study at 0.80. 10% dropout was added to the sample size, as this was commonly assumed to be a realistic buffer for participants who might withdraw due to personal reasons, illness or loss of interest. This dropout rate was adopted based on previous study in Health Sciences (Roslim et al., 2024)

Effect size index, $r = -0.52$

α error probability = 0.05

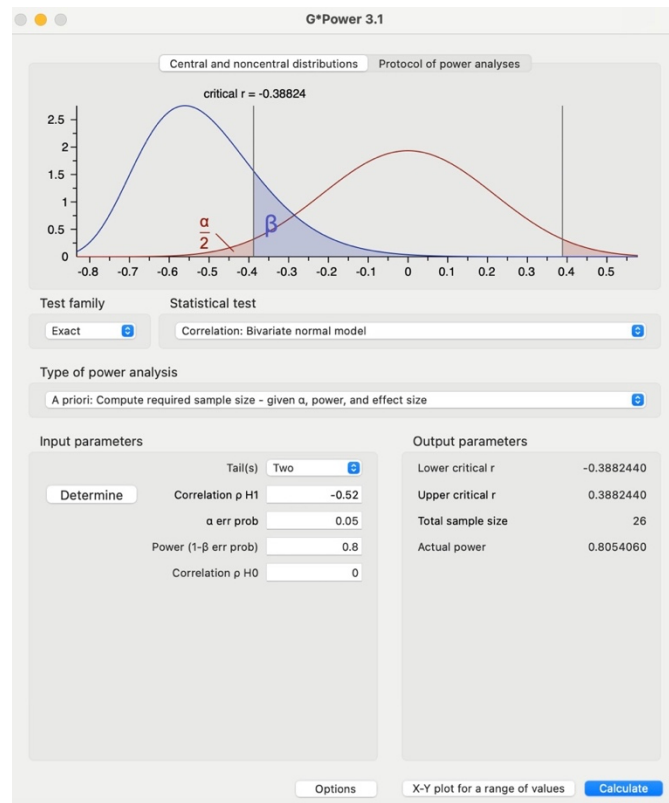
Power ($1-\beta$ err prob) = 0.8

Total sample size = 26

= 26 + 10% dropout rates added to the samples

= 28.6 samples

≈ 29 samples



3.5.2 Sample size calculation based on specific Objectives 2

For specific objectives 2, the sample size was calculated to determine the association between diabetes-related distress and glycaemic control among patients with type 2 diabetes in HPUSM, Kelantan.

G*Power Software was used to calculate sample size. A previous study among the Malaysian population reported a significant positive relationship between blood glucose levels and variables of diabetes distress ($r = 0.27$, $p = 0.03$) (Alvani, Zaharim, & Kimura, 2015). Therefore, an effect size of $r = 0.27$ was applied. The alpha error of probability was set at 0.05, and the power of study at 0.80.

Effect size index, $r = 0.27$

α error probability = 0.05

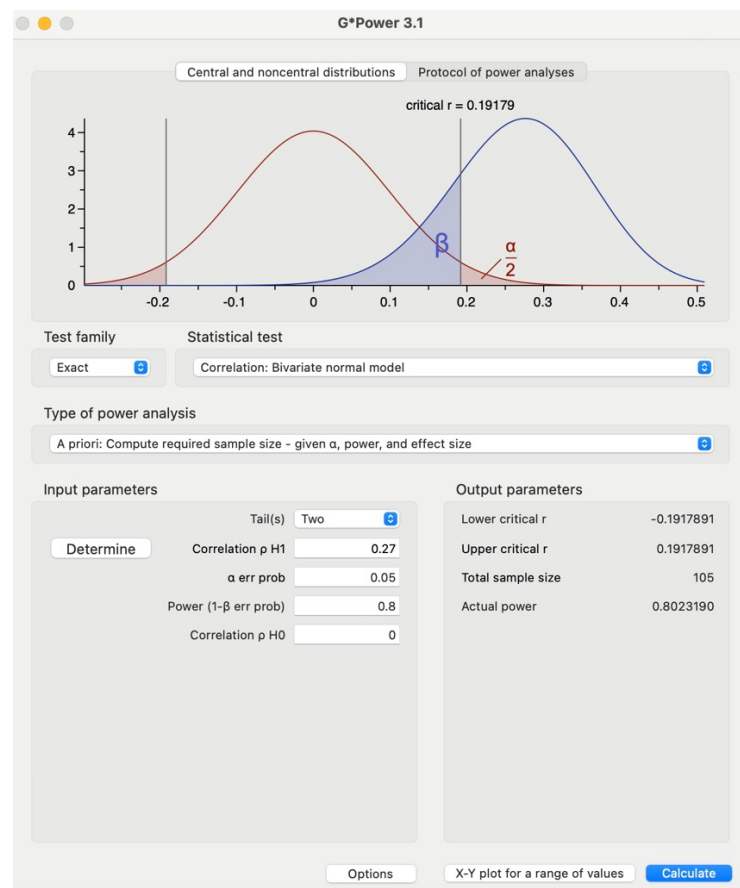
Power (1-err prob) = 0.8

Total sample = 105

=105 + 10% dropout rates added to the samples

=115.5 samples

≈ 116 samples



Based on the calculation of sample size from all the specific objectives above, the sample size ranged from 29 to 116. The highest sample size was selected. Hence, a total of **116 participants** who fulfilled the inclusion criteria participated in this study.

3.6 Sampling Method and Subject Requirement

This cross-sectional study used a convenience sampling method, whereby the researcher selected study participants for inclusion in the sample based on ease of access and availability. Convenience sampling was used because it was efficient in terms of recruiting participants who were conveniently available during the study period and practical in a busy hospital setting where random sampling would have been difficult to implement. It also reduced the need for substantial resources, time and manpower while ensuring that the required sample size can be achieved within the constraints of the study. This approach may lead to selection bias and limit generalisability. However, the use of strict inclusion and exclusion criteria has helped to minimise the bias and to ensure that the participants were relevant to the study objectives (Etikan et al., 2016). For outpatients, a total of five clinics were visited, namely the Klinik Pakar Perubatan (KPP), Klinik Rawatan Keluarga (KRK), Outpatient Dietetics Clinic, Staff Clinic, and Diabetes Centre. Patients who fulfilled both the inclusion and exclusion criteria who were interested in voluntarily taking part in the study were chosen as the study subjects. The first 116 subjects who met the criteria, consented to join the study and completed the questionnaire were selected as the study participants.

3.7 Research Tools and Materials

The research tool of this study were adopted from research conducted by Toobert et al. in 2000, which comprised of the Summary of Diabetes Self-care Activities (SDSCA) questionnaire. The SDSCA questionnaire showed acceptable internal consistency across different cultural adaptations. The Cronbach's alpha values for the validated Malay version ranged from 0.651 to 0.905 in Malaysia which confirmed its reliability in assessing the self-care activities among adults with type 2 diabetes (Mohamad Adam Bujang et al., 2015). This is consistent with the initial SDSCA (Toobert et al., 2000) with alpha values ranging from 0.61 to 0.87 and other international adaptations , which supports its use in different populations. The SDSCA questionnaire was obtained by

applying for both the version of English and Malay on the ePROVIDE website. Subsequently, an email was received containing the English and Malay questionnaires and User License Agreement was received. (Appendix F). The validated Malay translation of DDS-17 (MDDS-17) was retrieved from the author, Chew et al. (2015). The instrument demonstrated excellent internal consistency with a Cronbach's alpha of 0.94, indicating strong reliability. The MDDS-17 questionnaire and permission were obtained from the author through email. (Appendix F). The research tool for this study consists of 4 parts, which are:

3.7.1 Part A: Socio-demographic Data

This part requires study participants to provide their personal information and socio-demographic characteristics, which includes patient's gender, age, ethnicity, education level, marital status, employment status, and total monthly household income.

3.7.2 Part B: Medical History

This part requires study participants to provide their HbA1c value in the last 3 to 6 months, the duration of them having type 2 diabetes mellitus, comorbidities, treatment type, as well as medication compliance.

3.7.3 Part C: The Summary of Diabetes Self-care Activity (SDSCA)

This section investigates the diabetes self-care practices carried out by the participants in the past seven days. It includes 11 questions and is divided into five domains, which are diet, physical activity, blood sugar testing, foot care, and smoking. The diet domain consist of 4 questions, physical activity (2 questions), blood sugar testing consist (2 questions), foot care consist (2 questions) and smoking (1 question). Participants need to indicate how many days out of the past seven days they performed the self-care activities. Participants are considered having good adherence to the diabetes self-care

activities if they reported a score of ≥ 5 days for each question. This cut-off point is based on findings from a previous study (Marinho et al., 2018).

3.7.4 Part D: Diabetes Distress Screening Scale

This part aims to examine the distress level experienced by T2DM patients in the previous months. It includes 17 questions and is divided into 3 domain which is emotional burden (5 questions) that include question (No. : 2,3,4,10,14) , physician distress (4 questions) question from (No. : 1,5,11,15) and therapeutic support distress (8 questions) from question (No. : 6,7,8,9,12,13,16,17). Patients are required to indicate scale of distress they experienced based on 6-point Likert Scale (score 1-6) which include "Not a Problem (1), A Slight Problem(2), A Moderate Problem(3), Somewhat Serious Problem(4), A Serious Problem(5) and A Very Serious Problem(6). The score for all questions were sum up and divided by number of questions to get the total mean item score. Total score of <2.0 indicate no distress, moderate distress; $2.0 - 2.9$; high distress, ≥ 3.0 . This cut-off point is based on findings from a previous study (Fisher et al., 2012).

3.8 Operational Definition

3.8.1 Good adherence to diabetes self-care activities

Defined as a Summary of Diabetes Self-Care Activities (SDSCA) mean score of ≥ 5 days per week across domains (diet, exercise blood glucose monitoring, foot care), based on patient self-report over the past 7 days (Marinho et al., 2018).

3.8.2 Good glycaemic control

Defined as glycosylated haemoglobin(HbA1c) value of $<7\%$ (Ministry of Health Malaysia, 2020)

3.8.3 Poor glycaemic control

Defined as glycosylated haemoglobin (HbA1c) value of $\geq 7\%$ (Ministry of Health Malaysia, 2020)

3.8.4 Diabetes-related distress/diabetes distress

Defined as emotional distress that results from living with diabetes and the burden of relentless daily self-management measured using the Malay version Diabetes Distress Scale (MDDS-17) over the past month.

- a) Total DDS-17 score of <2.0 (No distress)
- b) Total DDS-17 score of $2.0 - 2.9$ (Moderate distress)
- c) Total DDS-17 score of 3.0 or greater (Severe/high diabetes distress)

3.9 Data collection method

This is a cross-sectional study involved patients with Type 2 Diabetes Mellitus (T2DM) at Hospital Pakar USM. Data collection began after receiving ethical approval from the Human Research Ethics Committee (JEPeM) of USM (USM/JEPeM/KK/26010030) and Director of Hospital Pakar USM (Appendix F). A Participant Information Sheet and Consent Form, together with questionnaire were distributed to the participants by using the convenience sampling method. Data collection was carried out from Mac 2026 until May 2026.

Data were collected based on participants' availability and willingness. The researcher visited the Klinik Pakar Perubatan (KPP), Klinik Rawatan Keluarga (KRK), Outpatient Dietetics Clinic, Staff Clinic, and Diabetes Centre at Hospital Pakar USM to identify potential participants. Potential participants were then approached and informed about the study. They were assured of the confidentiality of their response. Once participants expressed interest and willingness to take part, the Consent Form was

provided for signature. After obtaining informed consent, the researcher conducted the data collection by interviewing the participants using the questionnaire. HbA1c levels of the patients were recorded from the medical folder.

For every completed questionnaire was considered as participation in the study. These steps were repeated until the researcher has collected 116 responses. The first 116 responses were used for data analysis. Data were analysed by using Statistical Package for Social Sciences (SPSS), version 30.0. No honorarium was provided to the participants for completing the questionnaire. Completed questionnaires were stored in a closed folder to ensure privacy and confidentiality of participants.

3.10 Study Flowchart

Figure 2 shows the overall workflow the study, from the preparation of the research proposal to the ethical approval and institutional permission. Recruitment of participants was conducted using convenience sampling, followed by explanation of the study and distribution of consent forms and questionnaires. Only participants who fulfilled the inclusion and exclusion criteria and provided informed consent were interviewed to complete the questionnaire. Responses were accepted once consent was obtained, and data collection continued until sufficient responses were gathered. The last steps of the process were data entry, statistical analysis using IBM SPSS version 30.0 and thesis writing. This flowchart provides a visual summary of the sequence of steps followed in the study.

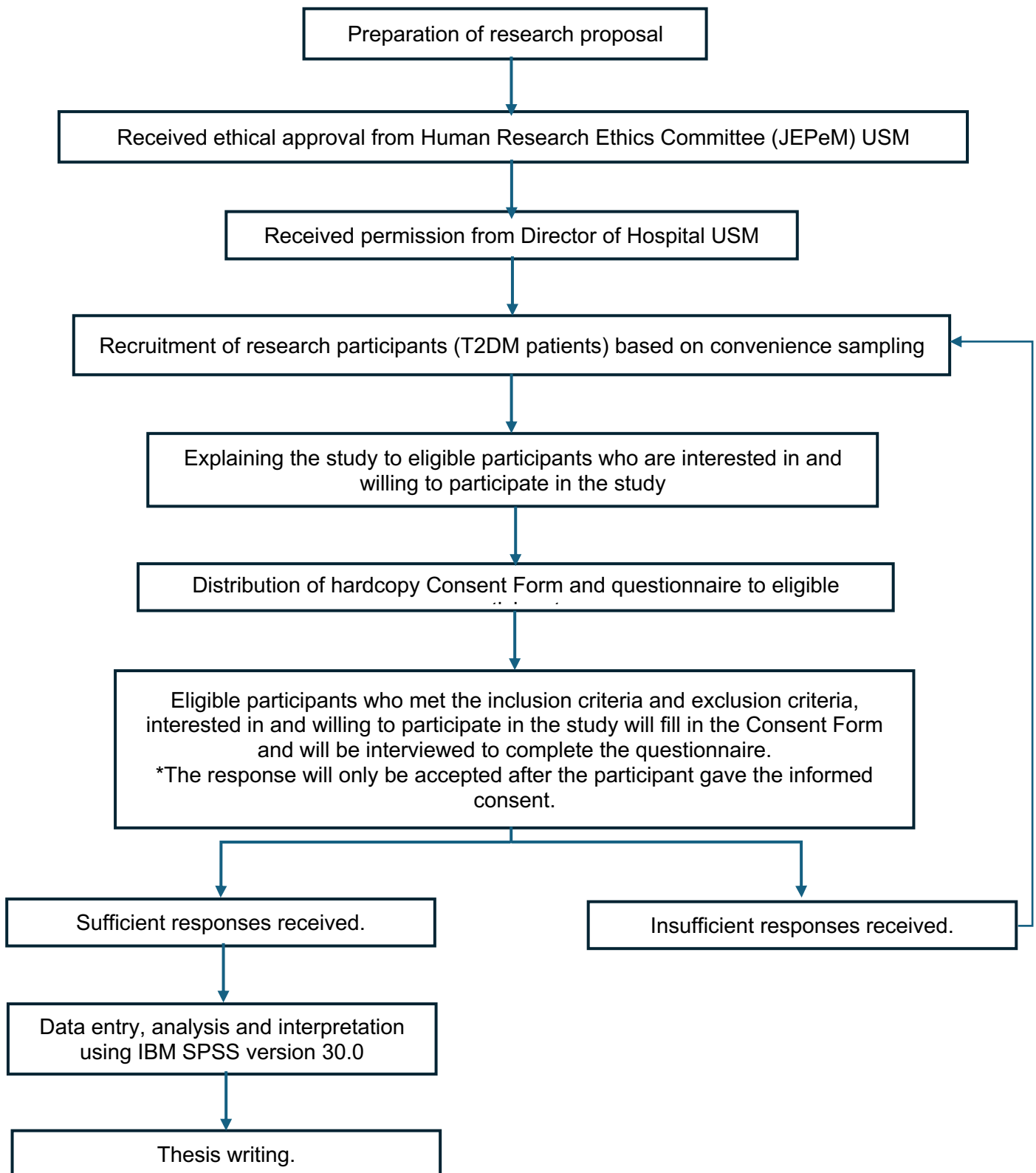


Figure 2 Flow Chart

3.11 Data Analysis

For this study, all data collected were analysed using Statistical Package for Social Sciences (SPSS), version 30.0. The statistical significance value was set at p-value less than 0.05, two tailed, at 95% confidence level. Descriptive statistics were used to calculate the mean, standard deviation, frequency and percentage of all variables. Numerical data were presented as mean and standard deviation (SD), and categorical data were presented as frequency and percentage (%). Data which are numerical in nature were recorded in both numerical and categorical form so that the mean, standard deviation, frequency and percentage of the variable could be reported.

To test whether the data collected are normally distributed, the Shapiro-Wilk test ($p > 0.05$) was performed. Normality was assessed using the Shapiro–Wilk test, which is designed to detect departures from a normal distribution and has greater statistical power than the Kolmogorov–Smirnov test, especially for small to medium samples. Thus, Shapiro–Wilk was considered the best option for this study (Razali & Wah, 2011; Ghasemi & Zahediasl, 2012). Pearson’s correlation was applied to examine the relationship between diabetes self-care activities and HbA1c, as well as between diabetes-related distress and HbA1c, provided that the assumptions of normality and linearity are met. If these assumptions were not met, Spearman’s rank correlation was used instead. Correlation coefficients (r) were interpreted based on their direction and strength, with p-values less than 0.05 considered statistically significant.

3.12 Ethical Considerations

This study was conducted after being evaluated and approved by the Human Research Ethics Committee of USM (JEPeM) and the Director of Hospital Pakar Universiti Sains Malaysia (HPUSM). Only participants who signed the informed consent form were enrolled in the study. Before participation the consent form was collected from each participants as a proof of voluntarily entry into the study. Participants were briefed about the purpose of the study, study procedures, potential benefits and risks, their right to withdraw at any time without penalty or loss of benefits, and the confidentiality of their response. The expected time required for the participants to complete the questionnaire was approximately 15 minutes.